

WHAT IS CLAIMED IS:

1. An displacement-measuring apparatus for measuring the extension and/or contraction of a sample as displacement, comprising a working means for extending or contracting a sample, a movable member connected to a front  
5 end of said sample, a reduced-friction bearing for supporting said movable member horizontally and movably, and a displacement sensor for detecting the displacement of said movable member, whereby said sample extends and/or contracts by the action of said working means to cause the displacement of said movable member, which is detected by said displacement sensor.
- 10 2. The displacement-measuring apparatus according to claim 1, wherein said displacement is measured by extending and/or contracting said sample while applying a load to said movable member in an opposite direction to the displacing direction of said movable member.
3. The displacement-measuring apparatus according to claim 1 or 2,  
15 further comprising a cell containing said sample, a pulley provided on the rear side of a front end of said movable member, and a weight suspending from said pulley with a string, the rear end of said sample being fixed in said cell, and said string being horizontally supported by said movable member and said pulley so that a load is applied from said weight to said sample when  
20 extending, and said working means acting to extend said sample, thereby displacing said movable member forward so that the extension of said sample is measured.
4. The displacement-measuring apparatus according to claim 1 or 2, further comprising a cell containing said sample, a pulley provided on the front  
25 side of a rear end of said movable member, and a weight suspending from said pulley with a string, the rear end of said sample being fixed in said cell, and said string being horizontally supported by said movable member and said pulley so that a load is applied from said weight to said sample when

contracting, and said working means acting to contract said sample, thereby displacing said movable member rearward so that the contraction of said sample is measured.

5. The displacement-measuring apparatus according to claim 3 or 4,

5 further comprising a cell-fixing member comprising a rod perpendicularly fixed to the rear end of said cell and a stand horizontally supporting said fixing rod, said sample being fixed to an inner surface of said cell.

6. The displacement-measuring apparatus according to claim 3 or 4,

10 further comprising a sample-fixing member comprising a fixing rod, a stand supporting said fixing rod, and a fixing plate perpendicularly fixed to the front end of said fixing rod, said fixing rod being horizontally supported by said stand, and said sample being fixed to said fixing plate.

7. The displacement-measuring apparatus according to any one of

15 claims 3 to 6, further comprising a work electrode connected to the rear end of said sample, an electrolytic solution contained in said cell, and a counter electrode soaked in said electrolytic solution, said work electrode being fixed in said cell, and said sample being soaked in said electrolytic solution, whereby said sample extends and/or contracts by the supply of electric current between said work electrode and said counter electrode.

20 8. The displacement-measuring apparatus according to claim 1 or 2,

further comprising a sample-fixing rod, a stand horizontally supporting said fixing rod, a pulley provided on the rear side of a front end of said movable member, and a weight suspending from said pulley with a string, said string being horizontally supported by said movable member and said pulley so that a  
25 load is applied from said weight to said sample when extending, and said working means acting to extend said sample, thereby displacing said movable member forward so that the extension of said sample is measured.

9. The displacement-measuring apparatus according to claim 1 or 2,

further comprising a sample-fixing rod, a stand horizontally supporting said fixing rod, a pulley provided on the front side of a rear end of said movable member, and a weight suspending from said pulley with a string, said string being horizontally supported by said movable member and said pulley so that a load is applied from said weight to said sample when contracting, and said working means acting to contract said sample, thereby displacing said movable member rearward so that the contraction of said sample is measured.

10. The displacement-measuring apparatus according to claim 8 or 9, further comprising a work electrode connected to said rear end of said sample, and a counter electrode connected to a front end of said sample, said rear end of said sample being fixed to said rod via said work electrode, and said front end of said sample being fixed to said movable member via said counter electrode, whereby said sample extends and/or contracts by the supply of electric current between said work electrode and said counter electrode.

11. The displacement-measuring apparatus according to any one of claims 1-10, wherein said reduced-friction bearing is an air bearing.

12. The displacement-measuring apparatus according to any one of claims 5 to 11, further comprising a stage vertically supporting said stand on the rear side of said sample, said stage being movable in the displacing direction of said movable member and/or in its opposite direction when receiving a signal from said displacement sensor.

13. An apparatus for measuring power generated as a pushing force and/or a pulling force by the extension and/or contraction of a sample, comprising a means for activating said sample, a movable member connected to a front end of said sample, a load cell attached to a front end of said movable member, and a reduced-friction bearing horizontally and movably supporting said movable member, said power generated by said sample by the action of said working means being transmitted to said load cell via said

movable member and measured thereby.

14. The power-measuring apparatus according to claim 13, wherein the pushing force and/or pulling force of said sample is measured with a load applied to said sample in an opposite direction to the moving direction of said movable member.

15. The power-measuring apparatus according to claim 13 or 14, further comprising a pulley provided on the rear side of a front end of said movable member, and a weight suspending from said pulley with a string, said string being horizontally supported by said movable member and said pulley so that a load is applied from said weight to said movable member when said pushing force is generated.

16. The power-measuring apparatus according to claim 13 or 14, further comprising a pulley provided on the front side of a rear end of said movable member, and a weight suspending from said pulley with a string, said string being horizontally supported by said movable member and said pulley so that a load is applied from said weight to said movable member when said pulling force is generated.

17. The power-measuring apparatus according to claims 13 to 16, further comprising a cell containing said sample, a work electrode connected to a rear end of said sample, an electrolytic solution contained in said cell, and a counter electrode soaked in said electrolytic solution, whereby said power is generated by the supply of electric current between said work electrode and said counter electrode.

18. The power-measuring apparatus according to claim 13 or 14, further comprising a sample-fixing rod attached to a rear end of said sample, a stand horizontally supporting said fixing rod, a pulley provided on the rear side of a front end of said movable member, and a weight suspending from said pulley with a string, said string being horizontally supported by said movable

member and said pulley so that a load is applied from said weight to said sample when said pushing force of said sample is generated.

19. The power-measuring apparatus according to claim 13 or 14, further comprising a sample-fixing rod attached to a rear end of said sample, a stand horizontally supporting said fixing rod, a pulley provided on the front side of a rear end of said movable member, and a weight suspending from said pulley with a string, said string being horizontally supported by said movable member and said pulley so that a load is applied from said weight to said sample when said pulling force of said sample is generated.

20. The power-measuring apparatus according to claim 18 or 19, further comprising a work electrode connected to the rear end of said sample, and a counter electrode connected to a front end of said sample, whereby said power is generated by the supply of electric current between said work electrode and said counter electrode.

21. The power-measuring apparatus according to any one of claims 13 to 20, wherein said reduced-friction bearing is an air bearing.

22. The power-measuring apparatus according to any one of claims 18 to 21, further comprising a stage vertically supporting said stand on the rear side of said sample, said stage being movable in the displacing direction of said movable member and/or in its opposite direction when receiving a signal from said load cell.